Home Automation Using IOT

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Abstract: With advancement of technology things are becoming simpler and easier for us. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual system. Through this project we have tried to show automatic control of a house as a result of which power is saved to some extent. Home automation involves introducing a degree of computerized or automatic control to certain electrical and electronic systems in a building. These include lighting, temperature control, etc. This project demonstrates a simple home automation system which contains a remote mobile host controller and several client modules (home appliances). The client modules communicate with the host controller through a wireless device such as a Bluetooth enabled mobile phone, in this case, an android based Smart phone. This paper is about home automation system which would use a Smartphone to enable the authorized user to operate all the appliances. The system has three components: an Arduino microcontroller for connecting the appliances, a Bluetooth module for signal transfer, and a Smartphone with running the Android application. Android Application decodes the user's voice command and extracts the exact meaning of his command. The design is based on an Arduino Uno board and the appliances are connected to this board using switches. The Smartphone interacts with the Arduino via Bluetooth. The main aim of the system development is to be low cost and scalable according to the requirements. Password protection can be used to be more secure. Voice controlled House Automation System makes the use of voice to control devices. The advantages of using voice as an interfacing medium are many. Firstly there is no need of training of operating technology. Secondly, the simplification of services would give us wider adoption of existing technology and would help people with varied disabilities access the same technology

Key Words: Android, Automation, Bluetooth, Arduino, Mechanization, Microcontroller.

I. INTRODUCTION

Internet of Things (IOT) is a concept where each device is assigned to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the “Internet of Computers.” Research studies have forecast an explosive growth in the number of “things” or devices that will be connected to the Internet. Due to the advancement of wireless technology, there are several different types of connections are introduced such as GSM, WIFI, and BT. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.

The main attraction of any automated system is reducing human labor, effort and time. home automation aims at automating the human lives. activating the home appliances without conventional switch but by using a smart phone is known as home automation. upcoming technology is natural language processing which enables us to command and control things with our voice. in modern era more importance is put on wireless technology. due to wired networks are messy and. complicated. These wireless technologies have great impact on human life in a positive manner and human development speed has increased. The main technologies used in home automation are GSM, Internet and Bluetooth. Each technology has its own merits and demerits. But Bluetooth based home automation systems have an upper hand. Devices can be connected from a range of 10m to 100m and this range can be increased. Also the frequency used for Bluetooth is 2.4GHz, which is available globally. The speed that can be fetched for Bluetooth services is up to 2.8 Mbps. So these advantages made way for high development in Bluetooth based home automation

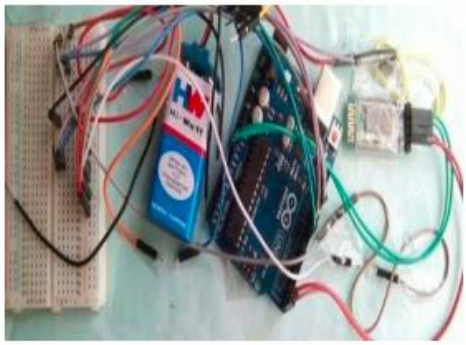
II. PROJECT DESCRIPTION

Smart Home using IOT:

A home automation system will have a hub which acts as a gateway, Modem or Wi-Fi router to connect to the internet and some smart devices. Here, smart devices refer to home devices like motion sensor, electric bulb, open/close sensor, etc., that send information to the hub, receive functionality instructions from the hub and perform the actions accordingly. For example, turning the light on/off. The purpose of home automation systems are to allow ease of access to all devices within a home either locally or remotely via the internet. Home Automation or demotics is building automation for a home , called a smart home or smart house . A home automation system will monitor and/or

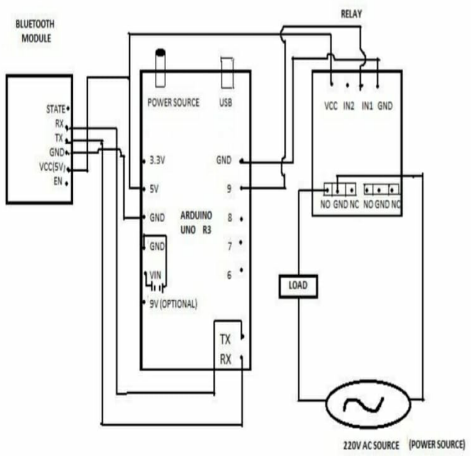
control home attributes such as lightning, climate, entertainment system, and appliances. It may also include home security such as access control and alarm systems. When connected with the internet, home devices are an important constituent of the internet of things.

Figure contains the automation model.



IOT as a term has evolved long way as a result of convergence of multiple technologies, machine learning, embedded systems and commodity sensors. IOT is a system of interconnected devices assigned a UIDS, enabling data transfer and control of devices over a network. It reduced the necessity of actual interaction in order to control a device. IOT is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow greater transparency, control, and performance when applied to any industry or system.

CIRCUIT DIAGRAM



A. **Circuit diagram** of Home Automation which illustrates the power supply and shows the flow of supply through the system.

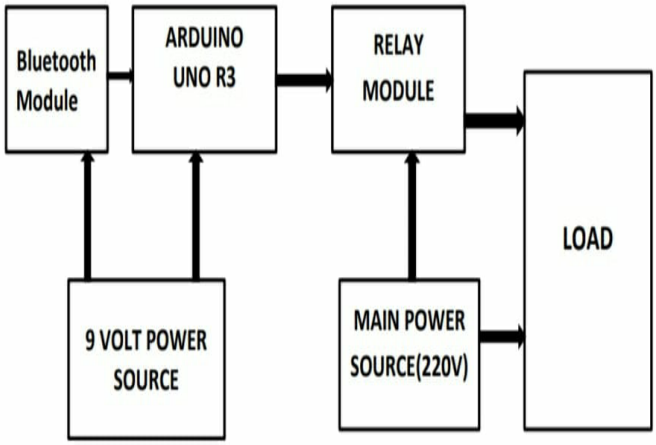
B. **Pin diagram**

This figure describes the different set of pins used in the home automation.

C. Block Diagram

The block diagram gives the functionality of the overall project. The Node MCU unit is the microcontroller or the main controlling unit of the system. The user uses the mobile application in setting commands for functioning of the appliances. The mobile application interprets the command form in user in voice or switch mode and sends signal to the Node MCU unit, over a wireless network established by Wi-Fi communication. Hence the Wi-Fi module (actually inbuilt into Node MCU), helps the microcontroller establish Wi-Fi communication with a device and take commands from an application over wireless network. The Node MCU on further receiving the signal then turns on/off the appliance with the help of relay. The Node MCU, relay and the final appliances are physically connected. There is a power supply unit that powers the microcontroller, the relay as well as the final appliances. There is also a display unit that displays the status of the application.

BLOCK DIAGRAM



2.2.7 Case 'D': Set PIN 2 HIGH.
2.2.8 Case 'd': Set PIN 2 LOW.
2.2.9 Case 'E': Set PIN 2 HIGH.
2.2.10 Case 'e': Set PIN 2 LOW.
2.2.11 Case 'F': Set PIN 2 HIGH.
2.2.12 Case 'f': Set PIN 2 LOW.
2.2.13 Case 'G': Set PIN 2 HIGH.
2.2.14 Case 'g': Set PIN 2 LOW.
2.2.15 Case 'H': Set PIN 2 HIGH.
2.2.16 Case 'h': Set PIN 2 LOW.
2.2.17 Case 'I': Set PIN 2 HIGH.
2.2.18 Case 'i': Set PIN 2 LOW.
2.2.19 Case 'J': Set PIN 2 HIGH.
2.2.20 Case 'j': Set PIN 2 LOW.
2.2.21 Case 'K': Set PIN 2 HIGH.
2.2.22 Case 'k': Set PIN 2 LOW.
2.2.23 Case 'L': Set PIN 2 HIGH.
2.2.24 Case 'l': Set PIN 2 LOW.
2.2.25 Case 'T': Set all PINs HIGH.
2.2.26 Case 't': Set all PINs LOW.
2.2.27 Case 'S': Send status of all PINs.
2.3 Set received equals to null.
3. If power is on go to 2.
4. Else End.

This figure describes the implementation of a Bluetooth technology and an android application with voice prompts-based home-automated system using an Arduino microcontroller. The system is aimed at

designing an automated appliance control that is user-friendly and convenient to use. The design comprised an Arduino ATMEGA328 microcontroller board.

II.COMPONENTS AND FEATURES

This microcontroller is based on the ATmega328. There are total of 20 pins (0-19) out of which 6 are analog inputs which can also be used as general-purpose pins, a ceramic resonator of frequency 16MHz, an USB connection, a power jack and a reset button. It contains everything needed to support a microcontroller.

Arduino Uno Board.

b.Bluetooth Module

Bluetooth Sub-modules work well with Arduino and other Microcomputers.HC-05 is a more capable module that can be set to be either Master or Slave. HC-05 is small (3 cm long) and run on 3.3V power with 3.3V signal levels, they have no pins and usually solder to a larger board. The module has two modes of operation, Command Mode where we can send AT commands to it and Data Mode where it transmits and receives data to another Bluetooth module. “Breakout" Boards that make these easy to use are available and recommended. These mount the sub- module like that shown on the right on a slightly larger board.

c.Sensors

In the broadest definition, a sensor is an object whose purpose is to detect events or changes in its environment, and then provide a corresponding output. A sensor is a type of transducer; sensors may provide various types of output, but typically use electrical or optical signals. For example, a thermocouple generates a known voltage (the output) in response to its temperature (the environment). A mercury-in-glass thermometer, similarly, converts measured temperature into expansion and contraction of a liquid, which can be read on a calibrated glass tube. The types of sensors used in this system are lm35 i.e temperature sensor and LDR i.e light detection sensor. Both of these sensors will be connected to arduino uno board and will be configured accordingly. These sensors will sense the light and temperature in the room and will allow user to manually switch ON and OFF the lights. Lm35 sensor will help the user to know the room temperature and the LDR sensor

will help the user to have control over the light remotely.

d.Intelligence

IOT comes with the combination of algorithms and computation, software & hardware that makes it smart. Ambient intelligence in IOT enhances its capabilities which facilitate the things to respond in an intelligent way to a particular situation and supports them in carrying out specific tasks. In spite of all the popularity of smart technologies, intelligence in IOT is only concerned as a means of interaction between devices, while user and device interaction are achieved by standard input methods and graphical user interface.

c. Connectivity

Connectivity empowers the Internet of Things by bringing together everyday objects. Connectivity of these objects is pivotal because simple object level interactions contribute towards collective intelligence in the IOT network. It enables network accessibility and compatibility in the opportunities for the Internet of things can be created by the networking of smart things and applications.

f. Dynamic Nature

The primary activity of Internet of Things is to collect data from its environment, this is achieved with the dynamic changes that take place around the devices. The state of these devices changes dynamically, example sleeping and waking up, connected and/or disconnected as well as the context of devices including temperature, location and speed. In addition to the state of the device, the number of devices also changes dynamically with a person, place and time

g. Enormous Scale

The number of devices that need to be managed and that communicate with each other will be much larger than the devices connected to the current Internet. The management of data generated from these devices and their interpretation for application purposes becomes more critical. Gartner (2015) confirms the enormous scale of IOT in the estimated report where it stated that 5.5 million new things will get connected every day and 6.4 billion connected things will be in use worldwide in 2016, which is up by 30 percent from 2015. The report also forecasts that the number of connected devices will reach 20.8 billion by 2020

h. Sensing

IOT wouldn’t be possible without sensors that will detect or measure any changes in the environment to generate data that can report on their status or even interact with the environment. Sensing technologies provide the means to create capabilities that reflect a true awareness of the physical world and the people in it. The sensing information is simply the analog input from the physical world, but it can provide a rich understanding of our complex world

i. Heterogeneity

Heterogeneity in Internet of Things as one of the key characteristics. Devices in IOT are based on different hardware platforms and networks and can interact with other devices or service platforms

through different networks. IOT architecture should support direct network connectivity between heterogeneous networks. The key design requirements for heterogeneous things and their environments in IOT are scalabilities, modularity, extensibility, and interoperability.

j. Security

IOT devices are naturally vulnerable to security threats. As we gain efficiencies, novel experiences, and other benefits from the IOT, it would be a mistake to forget about security concerns associated with it. There is a high level of transparency and privacy issues with IOT. It is important to secure the endpoints, the networks, and the data that is transferred across all of it means creating a security paradigm.

IV. RESULT

The experimental model was made according to the circuit diagram and the results were as expected. The home appliances could be remotely switched over Wi-Fi network. Both the switch mode and the voice mode control methodologies were successfully achieved. The Blynk application was also successful in displaying the status of every application.

PIN NAME ON NODE MCU DEVELOPMENT KIT	ESP8266 INTERNAL GPIO PIN NUMBER	PIN NAME ON NODE MCU DEVELOPMENT KIT	ESP8266 INTERNAL GPIO PIN NUMBER
0 [*]	GPIO16	7	GPIO13
1	GPIO5	8	GPIO15
2	GPIO4	9	GPIO3
3	GPIO0	10	GPIO1
4	GPIO2	11	GPIO9
5	GPIO14	12	GPIO10
6	GPIO12		

Table 1. Node MCU index ↔ GPIO mapping.

V. FUTURE SCOPE

Looking at the current situation we can build cross platform system that can be deployed on various platforms like iOS, Windows. Limitation to control only several devices can be removed by extending automation of all other home appliances. The prototype can include sensors to implement automatic control of the home appliances like; an LDR that can sense daylight and switch lamp accordingly, a PIR to detect motion and be used for security purposes making an alarm buzz, or a DHT11 sensor that's senses ambient temperature and humidity of atmosphere and switch fan/air conditioner accordingly. Scope of this project can be expanded to many areas by not restricting to only home, but to small offices

VI. CONCLUSION

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious

home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container. The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system and many more . Hence, this system is scalable and flexible.

VII. REFERENCES

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